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ABSTRACT

A theoretical distinction is made between the growth of word meaning and the development of word sense in Vygotsky's terms. A recall from semantic memory task and the semantic differential were used to operationalize these two conceptions of meaning in a study of 72 children aged 5 to 10 years. Results replicated typical findings for the growth of word meaning, showing increased extension and hierarchical organization of the concepts "animals" and "living things." Extension of the conventional principles of the growth of word meaning to the development of word sense led to the hypothesis that word connotation as measured by the semantic differential would become increasingly distinctive with age. In contradiction to the hypothesis, it was discovered that category instances become less distinctive with increasing age. These findings suggest that to the extent that word sense is important to word use, traditional strategies for studying developing word meanings may produce information relevant to a limited set of circumstances. It is argued that because word sense is central to the social use of the word, future research on semantic development should be broadened to include studies of word sense. (Author/RH)

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The Growth of Word Sense and Word Meaning

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ABSTRACT

A theoretical distinction is made between the growth of word meaning and the development of word sense (the set of psychological events aroused by the word) in Vygotsky's terms. A recall from semantic memory task and the semantic differential were used to operationalize these two conceptions of meaning in a study of 72 children aged 5 to 10 years. Results replicated typical findings for the growth of word meaning, showing increased extension and hierarchical organization of the concepts "animals" and "living things". Extension of the conventional principles of the growth of word meaning to the development of word sense led to the hypothesis that word connotation as measured by the semantic differential would become increasingly distinctive with age. However, in contradiction to the hypothesis it was discovered that category instances become less distinctive with increasing age. These unexpected findings suggest that traditional strategies for the study of developing word meanings may be producing information of relevance to a limited set of circumstances to the extent that the sense of the word is important to its use. Since many of the social uses of words have precisely this characteristic, it is argued that future research should be broadened along the lines suggested here.

Developmental psychologists have devoted considerable time and effort during the past decade to an elucidation of the growth of word meanings (e. g., Anglin, 1970, 1977; Clark, 1973; Nelson, 1974), in particular to the meanings of words in the "object language" (Russell, 1940). This line of research and thinking has been especially useful in that it connects to and partially integrates investigations from disparate areas, including work on processes of memory storage and retrieval, the operations of classification, and general semantics. In spite of its utility, however, there are limitations to research of this sort so long as its focus is upon meaning in the narrow dictionary sense. The goal of the study described here was to extend the study of meaning into the realm of connotation or the "sense" of words, to use Vygotsky's (1962) language, where the sense of a word includes the total set of psychological events aroused by the word. Furthermore, this extension was made using the sorts of object categories most frequently targeted in studies of word meaning, in particular "animals" and "living things". The instrument chosen for this extension was the semantic differential (Osgood, Suci, and Tannenbaum, 1957), which, although it does not sample all dimensions of "sense", does at least tap connotative aspects of meaning not tapped by conventional methods.

Certain general principles are typically agreed to operate in the growth of classes like those studied here, namely, that they become larger, more differentiated and hierarchically

organized with age (e.g., Inhelder and Piaget, 1964; Anglin, 1977). If these are truly generalized principles of the growth of the semantic system, then they should hold for measures of connotation as well. It was hypothesized, therefore, that as the meaning of a concept, such as "animal", becomes increasingly differentiated and hierarchically organized with age, the instances so differentiated should become more connotatively distinct.

Differentiation and organization were studied on the basis of semantic recall of instances from the categories "animals" and "living things". Connotation or sense was measured on a subset of instances from these categories, using the semantic differential. Details of the method employed are given below.

Method

Twenty-four children in each of three age groups (5-, 7-, and 10-year-olds) were asked to recall as many instances of each of two categories ("animals", and "living things") as possible. Items were recorded in the order of their recall. In addition, the children were asked to rate two sets of five items each (randomly drawn from a larger pool of items) on six semantic differential scales shown to be highly salient for school-aged children (diVesta, 1966). The six scales used were "good-bad", "beautiful-ugly", "strong-weak", "heavy-light", "fast-slow", and "sharp-dull". Prior to the task, the

experimenter made sure that the child knew all pairs of opposites. Ratings were made on a seven point scale represented as boxes along the middle portion of a board approximately 7.5 cm by 700 cm. The words representing the poles of the scales were written on cards and placed at opposite ends of the board. The child made his/her rating by placing a disc in the appropriate box on the board.

The sets of items rated on the semantic differential scales were designed to represent the nested categories "animals" and "living things". Each child rated a randomly selected subset of five items from each of the two categories. Items rated from the "living things" category always included exactly one non-animal (e.g., "tree", "daisy", etc.). Apart from this item, the distinction between the two subsets is arbitrary, and two separate rating sessions were scheduled only to minimize fatigue effects among the younger children.

The four tasks, two semantic recall and two semantic differential, were administered to a group of 72 children who also worked on a number of other tasks not presented here. The four tasks discussed in this paper were administered on four separate occasions, at least one day apart, with appropriate controls for order effects.

Results

The most obvious and straightforward indicator of an increase in the differentiation of a category is an increase in the

number of instances comprising the category. An age (3) by sex (2) ANOVA on number of items retrieved in the recall task revealed the expected main effects for age for both category conditions ($F(2, 71) = 8.81$, $p = .001$, for "animals"; $F(2, 71) = 13.54$, $p = .001$, for "living things"). In the "living things" condition, an age by sex interaction also occured ($F(2, 71) = 3.22$, $p < .05$), which, from an examination of Table 1, can be seen to result from a greater increase in the number recalled by boys than girls between the ages of 7 and 10 years.

An increase in number recalled is one index of an increase in differentiation, but an examination of the instances themselves suggested the fact more strongly. It seemed clear that the young child's "bear" became the 10-year-old's "grizzly bear, black bear, polar bear.....", and so on, and much of the increase in recall appeared to be the result of such differentiation of subcategories already known to the child. Furthermore, the order of the older child's recall suggested an increasingly hierarchical organization of the more differentiated set. The problem was to quantify, and thus to document, this shift.

Taxonomists have, of course, devoted considerable effort to the construction of a hierarchical system for animals and living things, and it was decided, somewhat arbitrarily, to use this system as a standard referent against which to evaluate the children's recall.[2] All of the items recalled by the children were identified as to their place in the taxonomic system, and each item in the set recalled by a child was compared with

those recalled immediately before and after it in order to determine the lowest level of commonality for those two items in the system. For example, "dog" and "cat" refer to animals in different families, but they are both members of the suborder fissipedia, or terrestrial carnivores. If these instances were recalled contiguously, the child would be marked as having produced a pair of instances sharing a common suborder designation. In this way, all ordered, contiguous pairs of items for all 72 children and for both conditions were scored into 13 categories ranging from "common entity" at the most global level, to "common species" at the most specific. Final tables were prepared (see Tables 2 and 3) showing frequency of pairings at every level of the hierarchy for each age level. Chi-square values were then computed for both the "animals" and "living things" conditions. For the "animals" condition, $\chi^2 = 78.95$, $df = 24$, $p < .001$; for "living things", $\chi^2 = 312.35$, $df = 24$, p .001. The difference between age groups can best be seen in Tables 2 and 3. The figures in parentheses, which sum to 1.00 across the rows, represent the proportion of the total pairings occuring at each level in the taxonomic system. From age 5 to 10 years, a subtle shift can be seen from more global to more specific. For example, the proportions for 5-year-olds tend to be somewhat greater than those for 10-year-olds in the "kingdom" category, and somewhat less in the category "suborder". Thus, the categories not only become more differentiated with age, their organization also becomes more hierarchical.

The finding that categories such as these increase in degree of differentiation and hierarchical organization was expected given the general principles of concept growth previously known (Inhelder and Piaget, 1964; Anglin, 1977). Although the discovery that the principles hold even in the context of the relatively unstructured semantic recall task represents a needed extension, the crucial issue concerns whether the principles can be shown to apply in the realm of word sense, as measured by the semantic differential.

Data from the semantic differential were first factor analyzed (principle factoring with iterations) to confirm the presence of Osgood, et. al.'s three primary dimensions of Evaluation, Potency, and Activity, which were in fact found to account for 72 percent of the variance. Each child's ratings of category instances were plotted in the resulting semantic space, and the generalized distance formula from solid geometry was used to compute the distance between all possible pairs of items in the three dimensional space. The mean distance was then computed as an index of the connotative distinctiveness of instances of the category. The larger the mean distance score, the more connotatively distinct the set. These mean distance scores were submitted to an age (3) by sex (2) ANOVA, with surprising results. F-ratios for the main effects of age were significant for both rating sessions ($F(2, 66) = 7.60$, $p = .001$ for the "animals" condition; $F(2, 66) = 3.79$, $p = .027$ for the "living things" condition) and for all items combined

($F(2, 66) = 14.012$, $p = .001$), but the direction of the effect was the reverse of that predicted. Mean inter-item distance decreased with increasing age, suggesting that instances of the nested categories "animals/living things" become less connotatively distinct at the same time that the category is becoming more differentiated and hierarchically organized.

Discussion

The results of this study present a fascinating paradox. As the child's experience with the instances of the categories increases, and a more sophisticated meaning structure of differentiated form develops, the connotative distinctiveness, or unique sense, of the items is gradually diminished. It seems unlikely that this pattern should hold for all categories. It is more probable that the developmental pattern is specific to those categories which are experienced by children in a particular way. Consider, for purposes of clarification, the following explanation of the pattern observed here.

With few exceptions, the average American child's exposure to animals occurs via books and television, supplemented by an ocassional safari to the local zoo. The child's functional relationship (Nelson, 1974) to these categories is thus generally homogenous, and more to the point, the experience is affectively fairly neutral, at least in a direct personal sense. The lion can't really kill, the snake slithers behind thick glass, and someone else holds the cuddly koala bear. To the extent that

the child's functional relationship, in a personal form, is important for the growth of word sense, then a homogenous set of experiences can be expected to produce a more nearly homogenous set of connotations for the associated words. Thus, as was the case here, growth of word meaning in the dictionary sense does not necessarily imply increasing distinctiveness of word sense.

If the functional explanation offered here is in fact accurate, then there should be a measureable difference between urban and rural children, at least with respect to certain categories and their instances. This hypothesis is currently under study in this and other paradigms. However, there is a more general, and more crucial, point to these data. These unexpected findings suggest that traditional strategies for the study of developing word meanings may be producing information of relevance to a limited set of circumstances. In most social circumstances, the use of a word depends quite heavily on the sense that it conveys. Meaning in the dictionary sense is, of course, essential for successful verbal communication, but important aspects of the communication are lost in the absence of shared word sense. Because word sense is central to the social use of the word, it is argued that future research on semantic development should be broadened to include this aspect of its growth. This won't always be a simple task. Word sense is inherently less stable than word meaning, and

therefore principles of development will not be easily discovered, but the past decade of research has left us better equipped to meet the challenge than when it was first presented nearly a half-century ago (Vygotsky, 1962).

	Animals		Living Things	
Age	Male	Female	Male	Female
5	25.50	24.33	25.42	27.58
7	36.92	36.75	38.75	41.25
10	55.33	38.67	63.67	43.33

Table 1. Age by sex breakdown of the mean number of items recalled in both the "animals" and "living things" conditions.

Age	Entity	Living	Kingdom	Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Subfamily	Genus	Species	N
5	4	7	94	6	150	6	172	21	57	22	4	20	16	572
	.01	.01	.16	.01	.26	.01	.30	.04	.10	.04	.01	.03	.03	
7	0	0	83	2	237	41	264	38	86	39	10	31	17	868
	.00	.00	.10	.00	.27	.05	.30	.04	.10	.04	.01	.04	.02	
10	0	0	107	11	284	30	325	56	149	60	26	30	16	1104
	.00	.00	.10	.01	.26	.03	.29	.05	.13	.05	.02	.03	.01	
	4	7	284	19	671	77	761	115	292	121	40	81	49	2544

Table 2. Frequencies, within subcategories of the taxonomic system, of the occurence of contiguous items in the child's recall from semantic memory for the category "animals". Decimals are proportions, summing to 1.00 across rows.

Age	Entity	Living	Kingdom	Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Subfamily	Genus	Species	N
5	104	52	87	6	96	36	142	10	42	14	2	9	18	618
	.17	.08	.14	.01	.16	.06	.23	.02	.07	.02	.00	.01	.03	
7	10	88	131	7	237	30	225	29	82	45	16	24	15	839
	.01	.10	.16	.01	.28	.04	.27	.03	.10	.05	.02	.03	.02	
10	10	116	163	13	219	67	285	72	164	71	16	39	17	1252
	.01	.09	.13	.01	.17	.05	.23	.06	.13	.06	.01	.03	.01	
	124	256	281	26	552	133	657	111	288	130	34	72	50	2709

Table 3. Frequencies, within subcategories of the taxonomic system, of the occurence of contiguous items in the child's recall from semantic memory for the category "living things". Decimals are proportions, summing to 1.00 across rows.

Table 4. A listing of items represented in Figures 4 through 6. The numbers indexing the category instances in the following list refer to the numbers appearing in the figures, which indicate the location of the corresponding item in the three dimensional space.

1. Buffalo
2. Crow
3. Daisy
4. Dog
5. Fish
6. Fox
7. Gorilla
8. Grasshopper
9. Monkey
10. Mouse
11. Octopús
12. Person
13. Rabbit
14. Rat
15. Sheep
16. Squirrel
17. Worm
18. Zebra

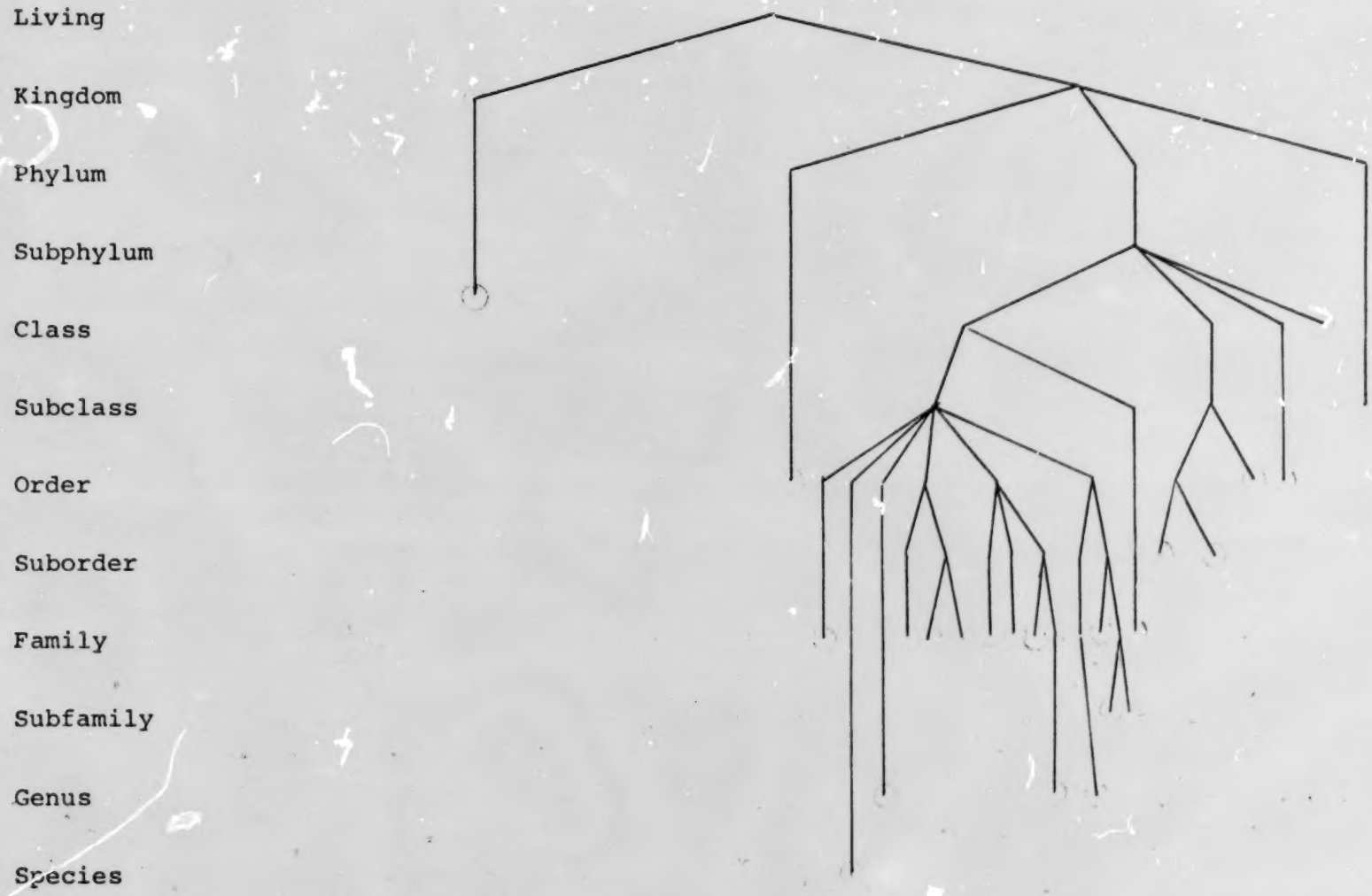

Figure 1. Schematic representation of semantic recall by a five-year old. Circled nodes represent actual items of recall.

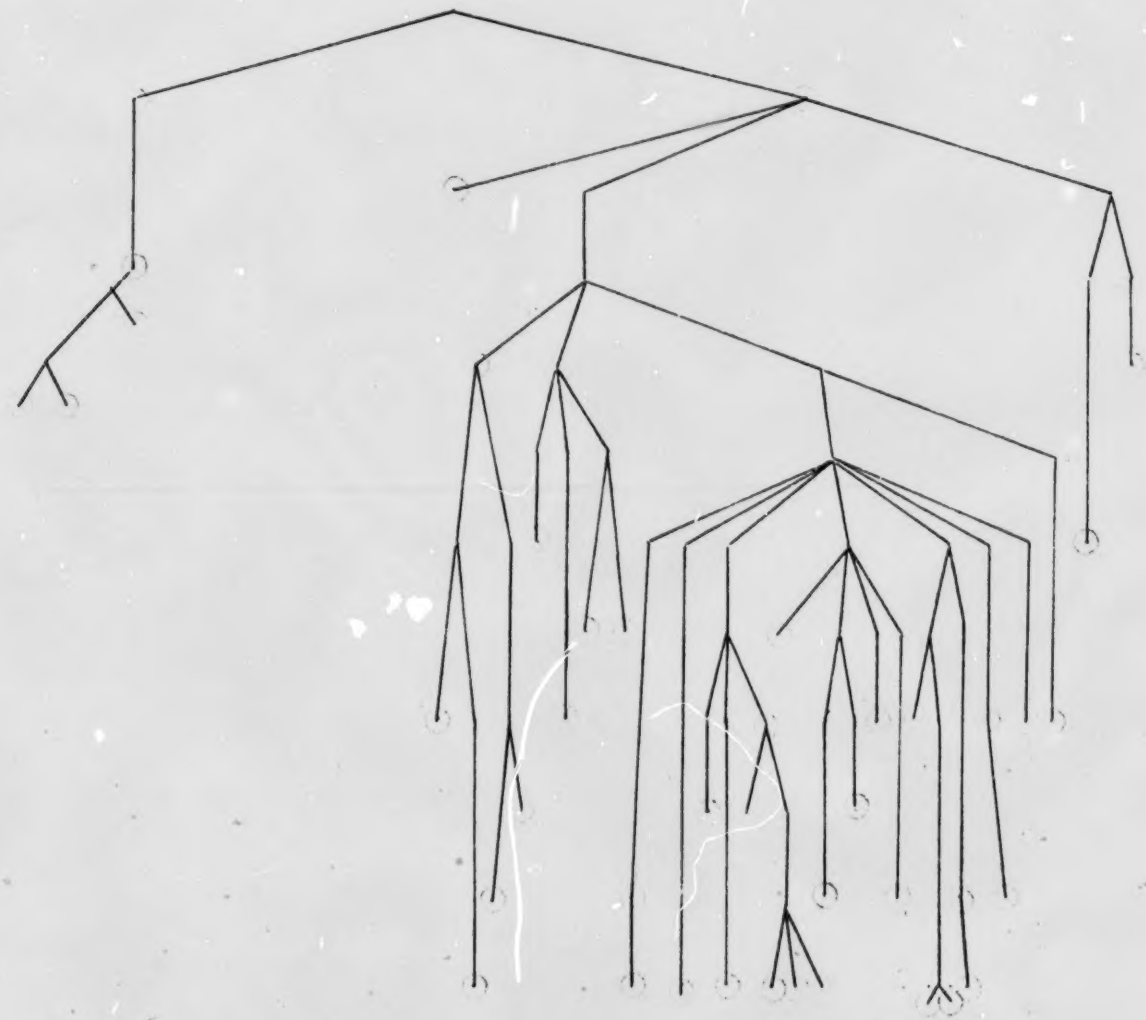

Figure 2. Schematic representation of semantic recall, "living things" condition, by a seven year old. Circled nodes represent actual items of recall

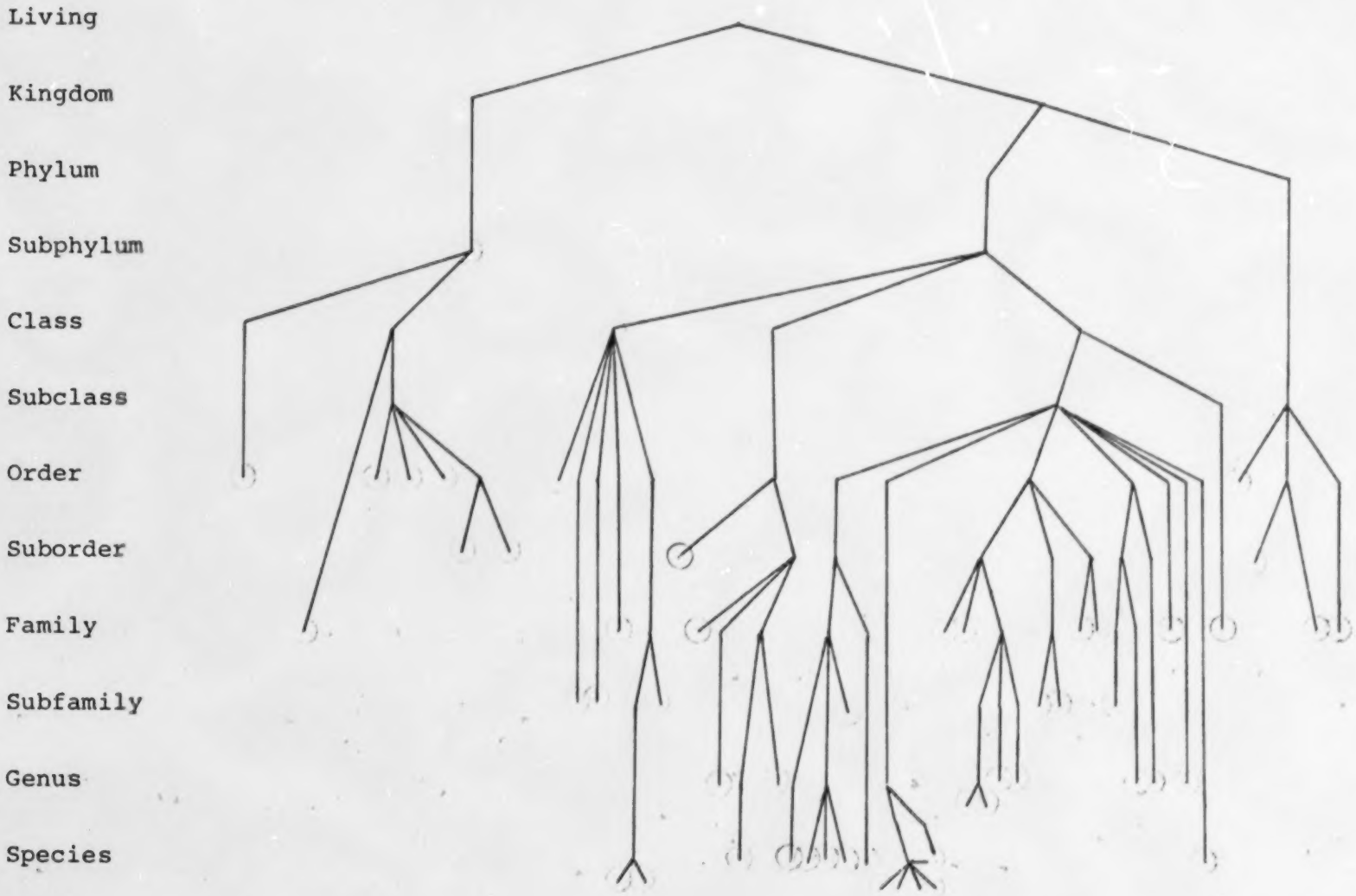

Figure 3. Schematic representation of semantic recall, "living things" condition, by a ten year old. Circled nodes represent actual items recalled.

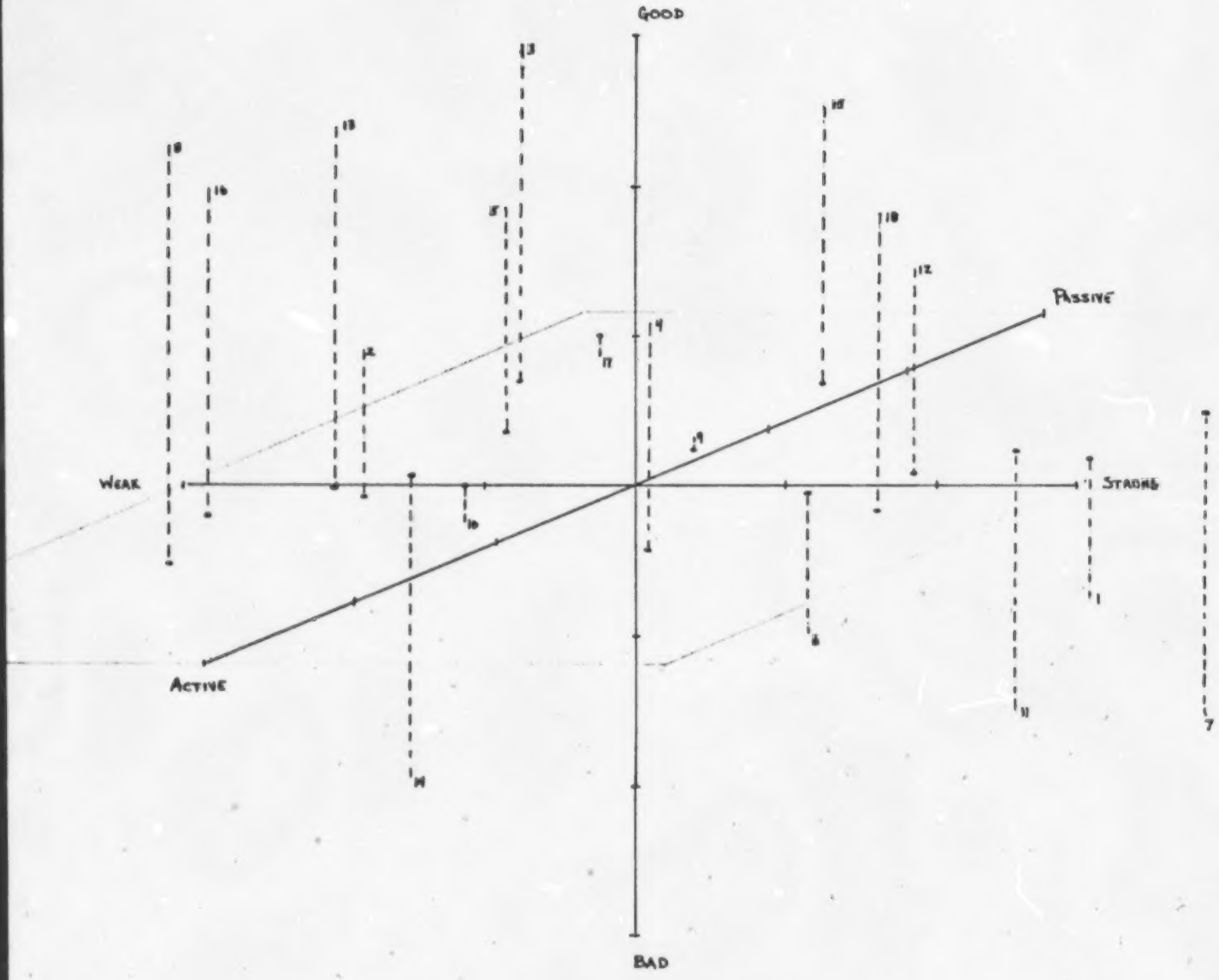

Figure 4. The semantic space, based on the semantic differential, for a subset of items, all rated by five year olds. Numbers near the points representing items rated refer to codes for those items, as indicated in the accompanying list (Table 4).

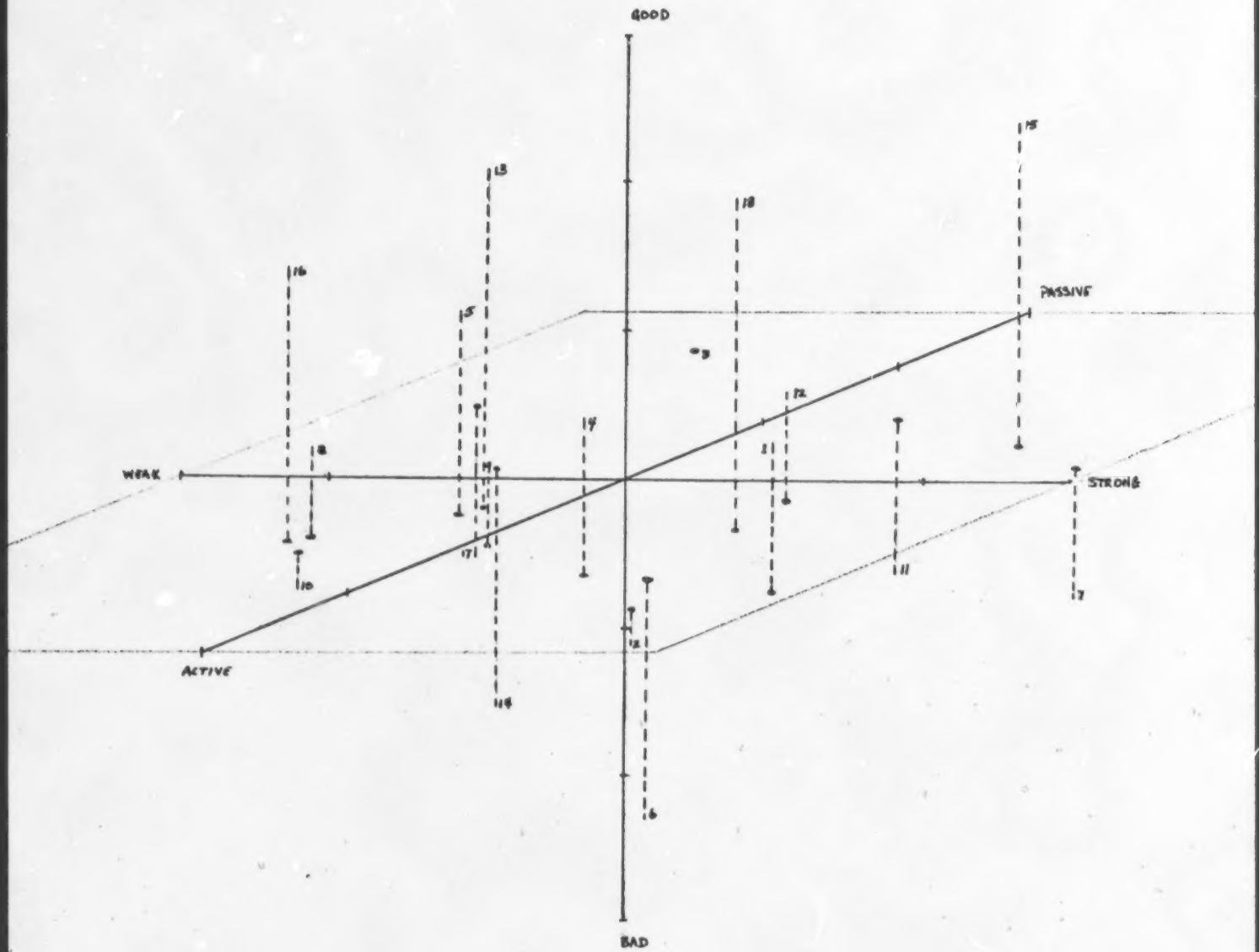

Figure 5. The semantic space, based on the semantic differential, for a subset of items, all rated by seven year olds. Numbers near the points representing items rated refer to codes for those items, as indicated in the accompanying list (Table 4).

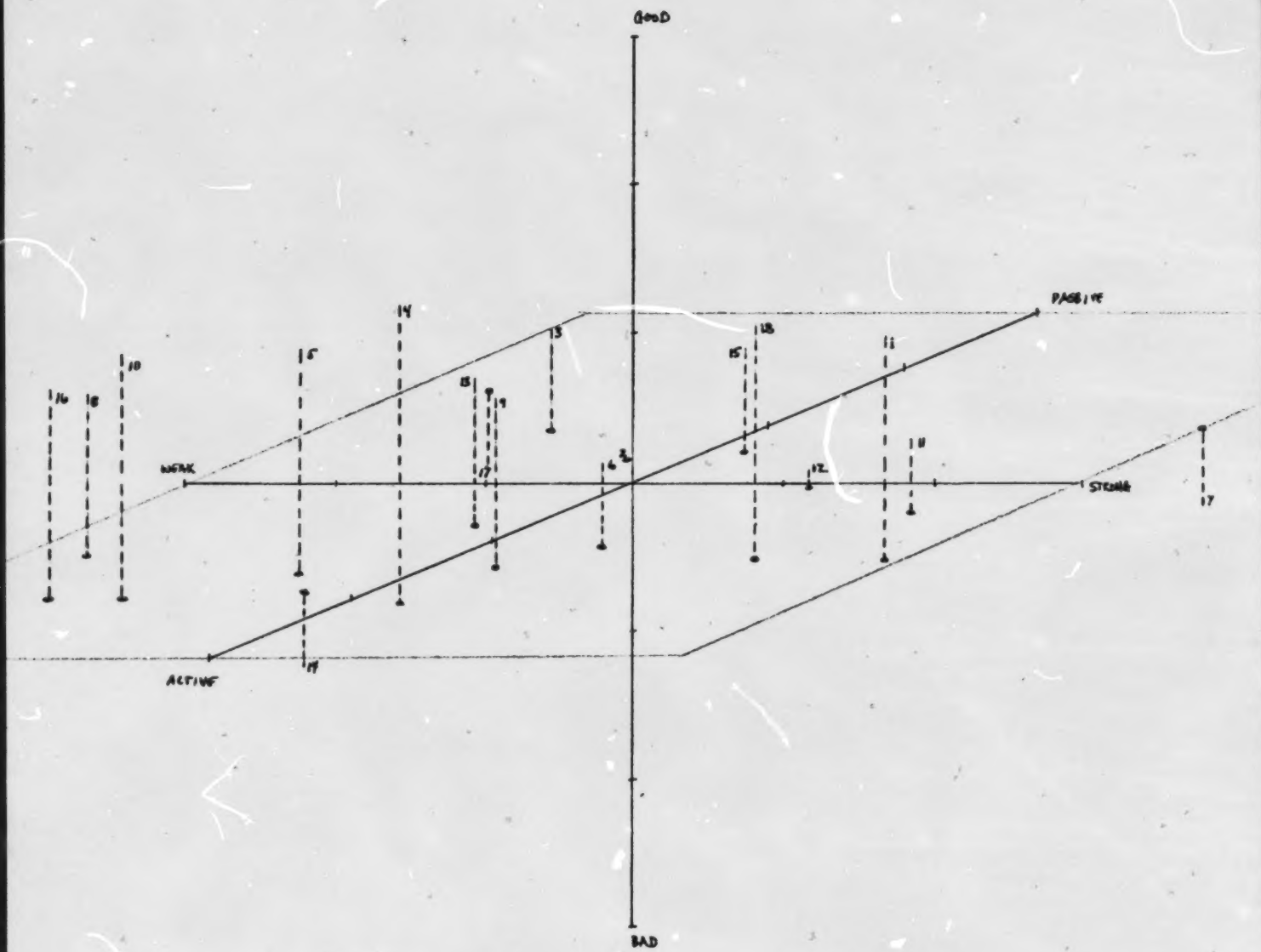

Figure 6. The semantic space, based on the semantic differential, for a subset of items, all rated by ten year olds. Numbers near the points representing items rated refer to codes for those items, as indicated in the accompanying table (Table 4).

Footnotes

[1] This project was begun while the author was a graduate student at Harvard University, and portions of the data reported here appeared as part of a dissertation entitled "The organization of children's concepts", directed by Jerome Kagan. I wish to express my special thanks to Professor Kagan for his valuable insight and encouragement throughout that project. My thanks also to Gwen Broude for her careful reading and helpful criticism of an earlier draft of this paper.

[2] This procedure was suggested to me by John Feroe of the Department of Mathematics at Vassar College.

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